

Effect of Computer- Based Multimedia Presentation on Senior Secondary Students' Achievement in Agricultural Science

Abiola Lateef Olori

Department of Science and Technology Education
Olabisi Onabanjo University, Ago-Iwoye, Ogun State Nigeria

Adekunle Olusegun Igboasanu

Department of Agricultural Education, Tai Solarin College Of Education, Omu-Ijebu, Ogun State, Nigeria

Abstract

The study was carried out to determine the use of computer-based multimedia presentation on Senior Secondary School Students' Achievement in Agricultural Science. The study was a quasi-experimental, pre-test, post-test control group research design type, using intact classes. A sample of eighty (80) Senior Secondary School One (SS II) students was selected from two secondary schools in Ijebu-Ode Local Government Area. The instrument for data collection was a 20-item multiple choice Agricultural Achievement Test (AAT) developed by the researchers for the purpose of measuring students' achievement in agricultural science. The instrument was validated by experts and subjected to reliability test and this yielded a reliability value of 0.85. The achievement tests were administered to the two groups before and after the treatment and the scores so obtained were analyzed by t-test statistical method. A self developed procedural instrument named "Computer - based multimedia maize breeding packages (CBMBP)" was used to teach the experimental group, while conventional method was used to teach the control group. In the study, three research hypotheses were tested. The result of the study revealed that the computer-based multimedia presentation was found to be more effective than the conventional method because significant difference exists in the mean achievement scores of students taught using the computer-based demonstration mode compared to those taught using the conventional method. It was recommended that recruitment of competent ICT teachers, adherence to the application of appropriate instructional technologies to capture and sustain students' interest, creation of good learning environment with adequate improvised instructional materials in all secondary schools will enhance achievement and good success in vocational subjects. Ministries of education, curriculum developers should outline appropriate ICT-based instructional approach that could be used by teachers to teach any topic highlighted in the agricultural science curriculum.

Keywords: Computer-Based Instruction, ICT, Senior Secondary Students, Agricultural Science Achievement.

Background to the study

Agriculture plays important roles in the economy development of all nations especially Nigeria and other developing countries (Adekoya & Olatoye, 2011). The importance of agriculture includes: Provision of food, employment for the working population, source of foreign exchange, generation of income for farmers, provision of materials for shelter, provision of facilities for recreation and tourism, provision of raw materials for industries and market for industrial goods (Apantaku, 2004; Iwena, 2002). There has been a drastic reduction in the standard of performance by students in science and technology at all levels of education in Nigeria (Emaikwu, 2012). The poor performance of students in science subjects has assumed a dangerous dimension. In the light of this, science educators need to seek suitable ways of tackling the current mass failure if they are to prevent the drifts of students to arts and social science subjects (WAEC Reports, 2008). The relevance and importance of agricultural science among the science subjects and its importance to economic development cannot be overemphasized. There is need for proper teaching of the subject in secondary schools so that students' scores in internal and external examinations will be high, thereby making the candidates' entrance into higher institutions easier (Akeem, 2007). The inadequacy of conventional teaching methods to improve students' interest, achievement and retention has become a source of concern to many educators. Therefore, teachers should be well equipped with the necessary 21st century skills needed for use in teaching school subjects if students' are to learn maximally (Nowak, Watt, Walther, 2004; Olori, 2010; Onabanjo, 2006).

The mode by which teacher presents instruction affect response from the students and determines whether they are interested, motivated and involved in a lesson in such a way as to engage in a good learning (Mtsem, 2011). What constitutes the 21st century skill for teachers is the use of appropriate technology, content and pedagogy in the classroom. Mishra and Koehler (2008) argue that teachers need to develop technological pedagogical content knowledge (TPACK) in order to be successful users of technology in their teaching. Thompson and Mishra (2007) argued that capable teachers must be able to flexibly incorporate new resources including technology into their knowledge of subject pedagogy in ways that enhance learning.

Abdulhamid (2010) submitted that studies have showed that the performance of the students in

agricultural science and practical agriculture in high schools respectively is not encouraging. Ikot (2008) noted that the poor performance of students in agricultural science examinations may not be unconnected with non-utilization of suitable instructional technologies. Many teachers go to classes to teach agricultural science and practical agriculture as liberal arts without any material to assist them or the learners. Learning is facilitated when the learners make use of at least three of the sense organs namely: seeing, hearing and touching (Nsa, 2012; Oke, 2002). Instructional technologies are the devices developed or acquired to assist or facilitate teachers in transmitting organized knowledge skills and attitudes to the learners within an instructional situation (Nwachukwu, 2006).

Teachers use different instructional technologies to motivate learning. In a study to determine the effects of instructional materials utilization on performance of Junior Secondary Students' in Practical Agriculture in Ikot-Abasi Local Government Area, Ikot (2008) adopted a quasi-experimental design using the population of 1995 students and the intact class sample size of 225 students. The findings showed that there was significant difference between the performance of students taught with filmstrip and those taught without filmstrip. Abass, Bimbo and Ojo (2012) in a study to determine the effects of Animated Agricultural Science instructional packages on Attitude and performance of Junior Secondary school Students in South West Area, Nigeria, discovered that the animated Agricultural Science Instructional packages significantly influenced the academic performance of the selected students. Osokoya (2007) in a study to determine the effects of video-taped instruction on Secondary School students' achievement in History discovered that there was significant difference between the mean scores of students taught history with video-taped instructional packages and those taught with the conventional lecture method.

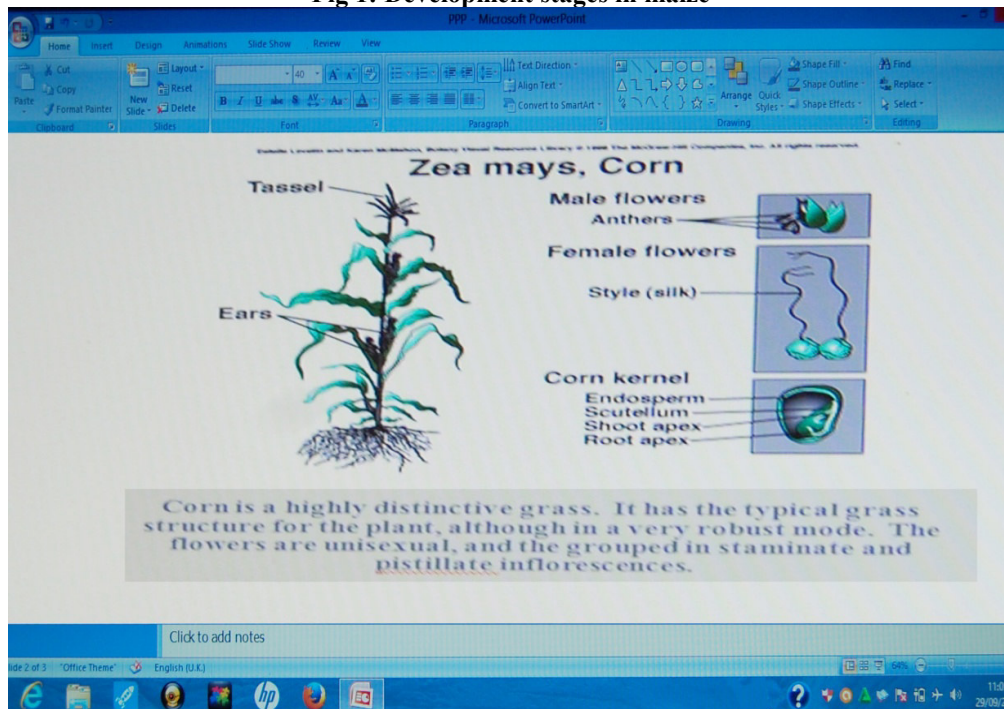
Computer-based multimedia presentation is the delivery of multimedia content by means of a computer to achieve learning goals through desired outcomes (Hillis, 2008; Yang, 2009). Multimedia is the ability of a system to communicate information simultaneously through multiple media: text, still images, graphics, photos, animated images, movies and sound. The emergence of new technologies has resulted in increased use of multimedia for teaching and learning in education (Omoniyi, 2005). Multimedia technologies have always fascinated educationists because of its strengths to communicate difficult concepts in simple ways. With the availability of more and more sophisticated computers with multimedia capabilities, the potentialities to use multimedia have also grown tremendously. Computer-based instruction brings with it several potential benefits as a teaching/learning medium. These include self-paced learning, self-directed learning, the exercising of various senses and the ability to represent content in a variety of media.

Various studies on learning styles have shown that when learners can learn in a way that suits them, improvements in the effectiveness of the learning process normally ensue (Wabuye, 2006). Alabi (2011), in a study that investigated the influence of multimedia on students attitude towards learning reported that multimedia presentation encouraged learning as they provided a stimulating environment and promoted enthusiasm. A multimedia based learning environment helps reserved students who are afraid to make mistakes in a classroom situation (Benedict, 2010). The use of computer-based multimedia presentation in carrying out instruction is an innovation in educational technology (Libin Yang, 2005). This mode of technology utilizes computer as a medium of presentation in form of text, pictures, graphics, tables and animations. The most important advantage of using computer as a demonstrator is that demonstration and illustration whether simple or complex can be placed under the control of the students, to be repeated, interrupted, slowed down, or even reversed at will (Adesanya, 2004). With the help of computer-based multimedia presentation, the teacher can make the content of the course lively and vivid to arouse the attention of the students (Olori, 2010). The figure below gives illustration of a computer based demonstration.

Computer-based multimedia presentation is not without its problems because with self-access programmes, learners can be left on their own too much and may feel overwhelmed by the information and resources available (Khoo, 2008; Rosenberg, Sander & Posluns, 2005). On the other hand, there may be too much direction from the computer if classroom methods are transferred to the computer. It must be noted that while various CBI models exist, not all CBI programmes offer all the benefits of CBI. Sometimes what is theoretically advocated is not implemented in practice, either due to lack of knowledge or technological unfeasibility (Aly, Elen, Willems, 2004).

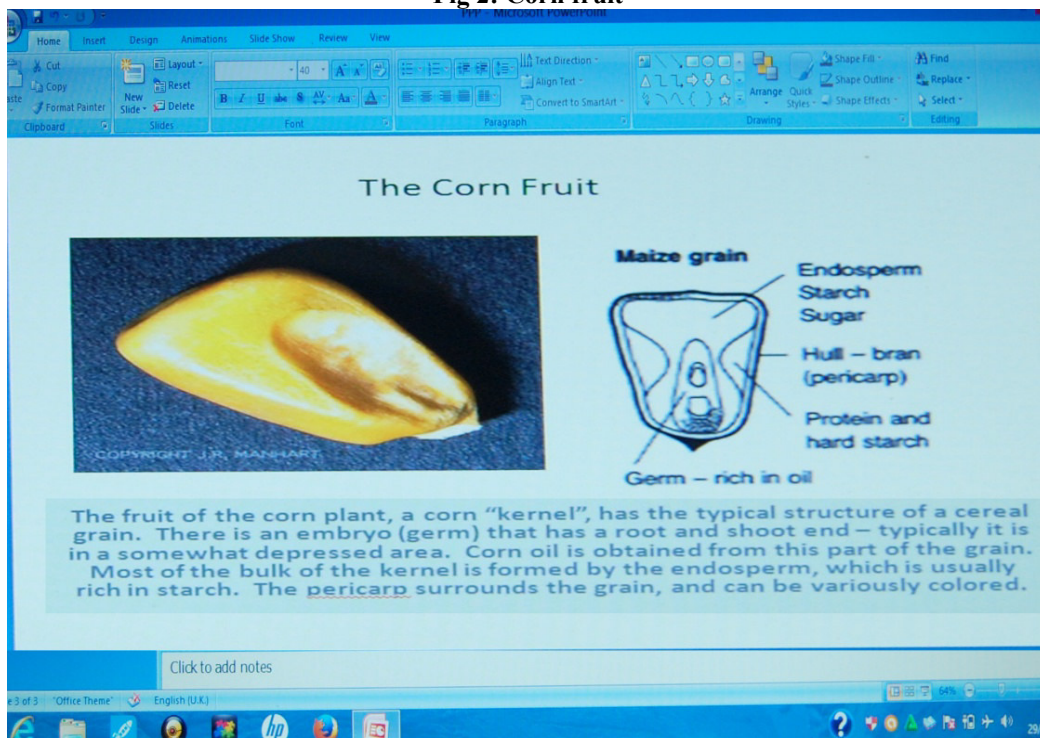
The figure 1, 2 and 3 below illustrate the topics on "the maize breeding processes" as presented with power point multimedia.

Fig 1: Development stages in maize



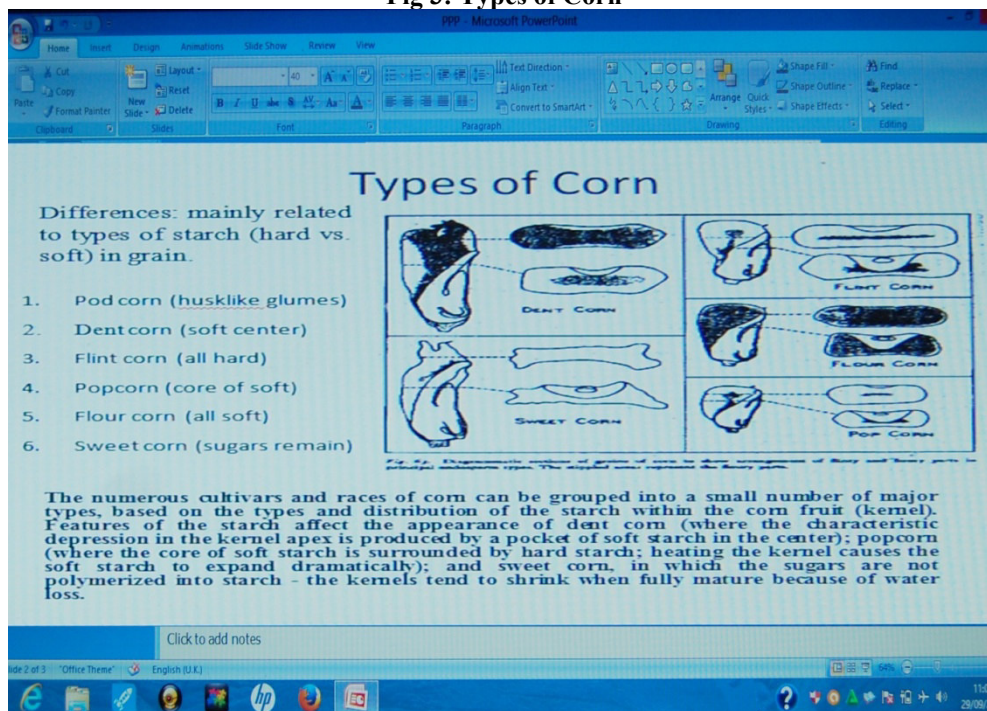
Source: Estelle Levetin & Karen Mc Mahon(1996)

Fig 2: Corn fruit



Source: Estelle Levetin & Karen Mc Mahon(1996)

Fig 3: Types of Corn



Source: Estelle Levetin & Karen Mc Mahon(1996)

Statement of the problem

Several studies have showed that chalk and talk method of teaching Agricultural Science in Nigeria Secondary Schools has not been effective in developing the vocational skills necessary for agricultural development as stated in the National policy on Education. It is also known that agricultural science is taught in the classroom theoretically without practical demonstration of facts. As a result of poor instructional presentation, students see the subject as difficult, hence they develop negative attitude towards it. One of the factors militating against students' achievement in the subject is lack of relevant instructional media.

However, despite the availability of ICT-based instructional packages in the market, many teachers hardly use them in the classroom. Therefore, this study seeks to investigate the impact of Computer-based multimedia presentation on senior secondary school students' achievement in Agricultural science

Purpose of the study

The study sought to determine the effect of computer-based demonstration mode on the achievement of students taught agriculture .It also sought to determine the difference in the achievement of students taught with computer-based multimedia presentation and those taught with conventional method.

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

H₀₁ There is no significant difference in the mean achievement scores of the two groups of students before receiving the treatment in agricultural science.

H₀₂ There is no significant effect of computer-based multimedia presentation on students' means achievement scores in agricultural science.

H₀₃ There is no significant difference in students' means achievement scores in Agricultural Science when taught using computer-based multimedia presentation and conventional method

Methodology

Design

A quasi-experimental pre-test, post test, control group design was adopted for this study. This design was adopted to determine the effects of computer-based multimedia presentation on students' performance. The performance of the pretest was used to compare the previous knowledge of the groups involved in the study. The post-test was used to assess the knowledge gained after the lessons.

Sample and sampling technique

All Senior Secondary School Two (SSII) Agriculture Students in Ijebu-Ode Local Government Area of Ogun State, Nigeria constituted the participants for the study. The sample size for the study was 80 students purposively selected at intact classes level in two schools that had 40 students per class. The selection of the school used for the experimental group was based on purposive sampling technique. The school have introduced their Basic 7 to 9 students to computer studies and application, the school have adequate supply of computer system where average of two students could be assigned to a functional computer system, the school have at least one computer instructor and there is availability of electricity and an alternate source of power in case of power failure.

Instrumentation

The procedural instrument used in the study is the "Computer - based multimedia maize breeding packages (CBMBP)" used for the experimental group (See fig: 1-3 above). It was adapted from Estelle Levetin & Karen Mc Mahon (1996) maize reading processes in agricultural science.

The measurement instrument called 'Agriculture Achievement Test' (AAT) was self developed by the researcher and it consisted of 20 multiple choice test items based on the topics in this study (maize husbandry).

Validation

The "Computer - based multimedia maize breeding packages (CBMBP)" were given to experts in educational technology for compliance with instructional materials design principles. The Agricultural Achievement Test (AAT) was validated by experts in Educational Evaluation and Agricultural Science. The experts ensured both face and contents validity of the instruments. The inputs that they made were incorporated in order to update the final copy of the instrument. It was further subjected to test-retest and from the students' response a reliability coefficient of 0.85 was established using the Kuder Richardson (KR 20) method.

Treatment Procedure

The study lasted for four weeks. In the first week, permission was obtained from principals of the selected schools. In the second week, pre-test on AAT was administered to the two intact classes selected, while the pre-test examination lasted for one hour. One of the researchers, an experienced agricultural science teacher administered the instructional packages to the experimental group. The instructional package on CD - Rom was installed on the systems at the computer laboratory by one of researchers who is an educational technology expert. The package for teaching the experimental group named: "Computer - based multimedia maize breeding packages (CBMBP)" consisted of computer programmed text, pictures and graphical illustration on maize husbandry. In the third week, all the groups were treated for one week of three lesson periods of 40 min each. In the experimental group, students were taken to the computer laboratory where they had hands on experience with the package. Two students were assigned to a functional computer. Lesson plan was used to treat the control group where the usual Agricultural Science Teacher was given out facts. In the fourth week, post-test of the AAT was administered to the two groups, while the test lasted for one hour.

Data Analysis

The data collected were analyzed with t-test statistical method to compare the means of the students' scores.

Results

Hypothesis one: There is no significant difference in the mean achievement scores of the two groups of student before receiving the treatment in agricultural science.

Table 1: Two-tailed t-test statistics of pre-test for Conventional and Treatment Groups

Groups	N	Means	Std. Dev.	Df	t-cal	t 0.05
Conventional (A)	40	9.80	3.46	78	1.84	1.99
CBMP (B)	40	8.63	2.06			

Table 1 above shows that there is no significant difference ($P > 0.05$) in the previous knowledge of the two groups of the senior secondary school students in agricultural science prior to the application of the two teaching methods. The value of t-calculated is less than the t-tabulated. The result shows that the null hypothesis is accepted.

Hypothesis two: There is no significant effect of computer-based multimedia presentation on students' mean achievement scores in agricultural science.

Table 2: t-test statistics for Pre-Test and Post-Test of Students taught Agricultural Science using Computer-Based Multimedia Presentation.

Groups	N	Means	Std. Dev.	Df	t-cal	t	0.05
CBMP Pre-Test	40	8.63	2.06	78	16.98	0.99	
CBMP Post-Test	40	16.45	2.06				

Table 2 above shows that Computer-Based Multimedia Presentation significantly influenced ($P < 0.05$) students' performance in agricultural science with the value of t-calculated greater than the t-tabulated. This result shows that the null hypothesis was rejected.

Hypothesis three: There is no significant difference in students' mean achievement scores in agricultural science when taught using conventional and Computer-Based Multimedia Presentation

Table 3: t-test statistics for the Post-Test of Students taught Agricultural Science using the Conventional and Computer-Based Multimedia Presentation.

Groups	N	Means	Std. Dev.	Df	t-cal	t	0.05
Conventional Post-Test (A)	40	13.18	2.05	78	6.31	1.99	
CBMP Post-Test (B)	40	16.45	2.06				

Table 3 shows that there is significant difference ($P < 0.05$) in students' achievement scores in agricultural science when taught using Computer-Based Multimedia Presentation. This result shows that t-calculated is greater than t-tabulated value, thus the null hypothesis is rejected. Hence, computer-based multimedia presentation proves more effective in facilitating students' achievements and understanding than the conventional method.

Discussion

The results in table one reveal that there was no significant difference in the achievement of the two groups of students prior to the application of the treatment. This could be ascribed to the fact that the students are of the same background and also to the fact that agricultural science teachers in the selected schools have been using the appropriate teaching methods which they acquired during training. This result was supported by Adekoya and Olatoye (2011) that correct use of an appropriate presentation mode is critical to successful teaching and learning. The result in table two reveals significant impact of computer-based multimedia presentation on students' achievement in agricultural science. This could be attributed to the fact that computer-based multimedia presentation enables students to be actively involved in the lesson. This is supported by Apantaku (2004) which posited that active participation of learners does assist them to acquire practical skill and knowledge through interaction and visual perception. The result corroborates the earlier findings of Alabi (2011) and Wabuyele (2006) who revealed that skills are best learnt through practices rather than mere listening. Active involvement of the students in the practical agricultural science lesson has led to tremendous improvement in their achievement in the subject.

The result in table three reveals the superiority of the computer-based multimedia presentation over the conventional method of instruction. The computer-based multimedia presentation significantly enhanced students' achievement in agricultural science and it was found to be more effective than the conventional strategy. This could be ascribed to the fact that skills are best learnt through practices rather than mere listening. This result pointed to the earlier view of Khoo (2008) who reported that computer-based instruction is generally effective in teaching sciences, mathematics and mechanics as well as subject areas within vocational and technical education. Abass, Bimbo and Ojo (2010) reported that computer-based instruction was more effective than discussion method in enhancing students' achievement in agricultural science. This result also corroborates the earlier findings of Olatoye and Adekoya (2010) who reported that demonstration method of teaching was more effective in raising students' achievement in agricultural science and Adekoya and Olatoye (2011) observed that there was significant effect of demonstration method of teaching on students' achievement in agricultural science compared to the conventional method.

Conclusion

The result of this study has provided an empirical basis that Multimedia-Based presentation is an appropriate teaching strategy capable of improving the achievement of students in agricultural science. It is therefore evident that the use of ICT-Based teaching enhanced students' achievement in real sense than the conventional method. Based on the results of this study, it can be concluded that there was a significant effect of Computer-based multimedia on the mean achievement scores of students taught agricultural science

Recommendations

In view of the findings in this study, the following recommendations are proffered:

- For effective teaching of agricultural science, attention should be given to qualified teachers to handle the teaching. Hence, recruiting, preparing and training teachers with ICT knowledge should be the central strategies for improving schools because teachers are instrumental in translating subject contents into teachable classroom lessons.
- Individual teacher should ensure adherence to the application of appropriate teaching methods based on topics with different instructional technologies to capture and sustain student's interest.
- Ministries of education, curriculum planners and developers should outline appropriate Computer -base demonstration mode for use by teachers to teach any topic highlighted in the agricultural science curriculum.
- Good learning environment with adequate instructional materials should be put in place in all secondary schools and technical colleges to enhance achievement and good success in vocational subjects.

References

- Abass, B.T., Bimbo, A., & Ojo A.O. (2012). Effects of animated agricultural Science Instructional Package on attitude and performance of Junior Secondary School Students in South-West Nigeria. *Mediterranean Journal of Social Science*. 3(1),425- 435.
- Abdulhamid, A. (2010). Effects of two teaching methods on Secondary School Students' Agricultural Science Performance in Bauchi Metropolis, Nigeria. *Journal of Research in Education*, 1 (1), 1-12.
- Adekoya, Y.M. and Olatoye, R..A .(2011). Effect of Demonstration, Peer-Tutoring, and Lecture Teaching Strategies on Senior Secondary School Students' Achievement in an Aspect of Agricultural Science. *The Pacific Journal of Science and Technology*. 12 (1), 320-332.
- Adesanya, Anu .(2004). *Impact of Computer Assisted Instruction (CAI) in Teaching and Learning Process*. Lucky Odoni (Nig.) EnterprisesPublisher, Ijebu Ode, Nigeria.
- Akeem, I.A. (2007). *Practices and Teaching Methods*. An unpublished lecture notes of the College of Education, Katsina-Ala, Benue State.
- Alabi, T.O .(2011).Development and Validation of Self Instructional Computer-Based Package for Teaching and Learning Social Studies in Senior Primary Schools. *Journal of Technology and Education in Nigeria*, 16,(1).
- Aly, M., Elen, J., & Willems G.(2004).Instructional multimedia program versus standard lecture: a comparison of two methods for teaching the undergraduate orthodontic curriculum. *European Journal of Education*, (8)43-46.
- Apantaku, S.O. (2004). Analysis of Senior Secondary Agricultural Science Students' towards Agriculture as a Career. *Journal of Extension Systems*, 20 (1), 42-54.
- Benedict,N.J.(2010).Re-Positioning The Nigerian Higher Education System Through Technology: E-Learning. *Journal of E-Learning (JOEL)*, 9(1), 74-86
- Emaikwu, S.O. (2012). Assessing the Relative Effectiveness of Three Teaching Methods in the Measurement of Students' Achievement in Mathematics. *Journal of Emerging Trends in Educational Research Policy Studies*, 3 (4), 479-486.
- Estelle, L and Karen, M.(1996). *Botany visual resource library*. The Mc Graw-Hill Company.
- Hillis, P. (2008). Authentic learning and multimedia in history education. *Learning, Media and Technology*, 33(2), 87-99.
- Ikot, A.S. (2008). *Effects of Instructional Materials Utilization on performance of Junior Secondary Students in Practical Agriculture in Ikot- Abasi Local Government Area*. Unpublished M.Sc. Thesis, University of Uyo, Uyo.
- Iwena, O.A. (2002). *Essential Agricultural for Science for Senior Secondary Schools*, (6th edition), Lagos:Toner Publication Co.(pp 2).
- Khoo, E.M.(2008). Teaching methods used in primary care. *Malaysian Family Physician* (3),42-44.
- Libin yang(2005). Eight CAI modes in language learning and teaching. *Sino-US English Teaching*. 2(2),62-66
- Mishra, P., and Koehler, M. J. (2008). *Introducing Technological Pedagogical Content Knowledge*. Paper presented at the Annual Meeting of the American Educational Research Association. Retrieved from http://punya.educ.msu.edu/presentations/AERA2008/MishraKoehler_AERA20_08.pdf
- Mtsem, A.A. (2011). *Effects of diagnostic and contextual instructional strategy on students' interest and achievement in secondary school algebra*. Unpublished Ph.D thesis of the Faculty of Education, Benue State University, Makurdi.
- Nowak, K.L., Watt, J. and Walther, J.B. (2004). Contrasting time mode and sensory modality in the performance of computer mediated groups using asynchronous video conferencing. *Proceedings of the 37th Hawaii International Conference on system sciences*.

- Nsa, S.O.(2012). Instructional Strategies and Students Skills Acquisition in vegetable production, *Journal of Business Economics Review*, 3(1).
- Nwachukwu, C.E .(2006). *Designing Appropriate Methodology in Vocational and Technical Education for Nigeria*, Nsukka University: Trust Publishers.
- Oke, J.O. (2002). *Principles and Methods of Teaching for Colleges*.(1st ed.) Abeokuta: Satellite Publishing Co. (pp. 44-51).
- Olatoye, R.A. and Adekoya, Y.M. (2010). Effect of Project-Based, Demonstration and Lecture Teaching Strategies on Senior Secondary Students' Achievement in an Aspect of Agricultural Science. *International Journal of Educational Research and Technology*, 1 (1), 19-29.
- Olori, A.L. (2010). *Introduction to Educational Technology*, (Revised ed.). Ijebu-Ode: Bosun Press Ltd (pp 183-197).
- Omoniyi, T. (2005). *Principles and application of educational technology*. Ibadan: Bash Moses Publishers
- Onabanjo, C.F. (2006). *The "Teaching" Itself*. In *A Handbook for Effective Teaching Practice*. Faith Unity Press Ltd. Abeokuta.
- Osokoya, I.O .(2007). Effects of Video taped Instruction on Secondary School Students' Achievement in History, *International Journal of African American Studies*. 6(1),27- 34.
- Rosenberg H., Sander M & Posluns J.(2005). The effectiveness of Computer-aided learning in teaching orthodontics: A review of the literature. *American Journal of Dentofacial Orthop* (127),599-605.
- Thompson, A., & Mishra, P. (2007). Breaking News: TPACK Becomes TPACK! *Journal of Computing in Teacher Education*, 24(2), 38-64
- Wabuyele, L.(2006). Computer use in Kenyan Secondary Schools: Implications for Teachers Professional Development. In C. Crawford et al., *Proceedings of Society for Information Technology & Teacher Education International Conference Chesapeake, VA: AACE*.(pp.2084-2090).
- West African Examination Council Reports .(2008). *Chief Examiners and Team Leaders Report*. West African Examination Council: Yaba, Lagos, Nigeria.
- Yang, S.C. (2009). A case study of technology-enhanced historical inquiry. *Innovations in Education and Teaching International*, 46(2), 237-248.